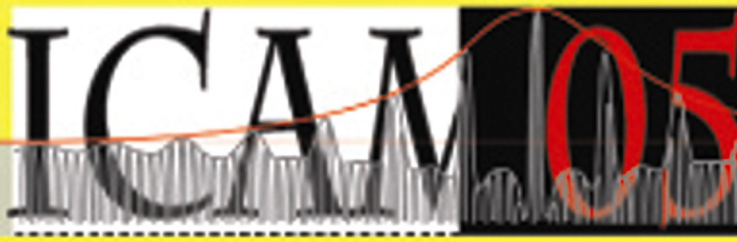

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Long-Distance Wave-Group Propagation using a Variational Boussinesq Model

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Abstract: Water waves at sea are always grouped: sequences of higher waves are alternated by sequences of lower waves. Due to non-linearity, the wave groups are accompanied by bound sub- and super-harmonic wave components, as well as by amplitude dispersion besides the linear frequency dispersion. When modelling the wave motion, one has to distinguish the horizontal propagation space of the waves and a vertical cross-space. Starting from a variational principle we integrate out the vertical cross-space by using a Boussinesq-type polynomial approximation for the vertical flow structure. This results in a model maintaining the positive-definiteness of the Hamiltonian, which leads to good dynamic behaviour of the approximate equations. At the conference, we will show how the model can be used to propagate wave groups above slowly-varying sea bed over large distances, predicting the changes in the wave group shape and the generation of free long waves (which are important for moored ship dynamics and coastal morphology).

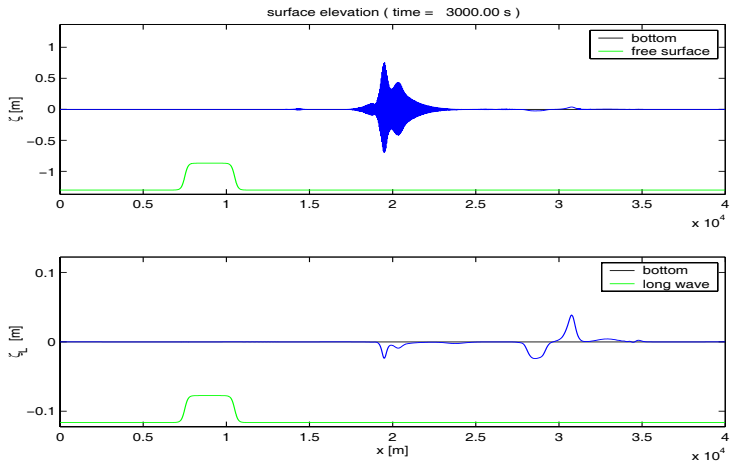

Figure caption: Upper graph: Sea bed shape (green line, not on scale) and free-surface elevation (blue line) after an initial soliton has propagated for 600 wave periods. Lower graph: Low-pass filtered long-wave part of the free-surface elevation (blue line) in the upper graph.

Keywords: variational method, non-linear water waves, inhomogeneous media